RED WOLF MANAGEMENT SERIES
TECHNICAL REPORT NO. 1

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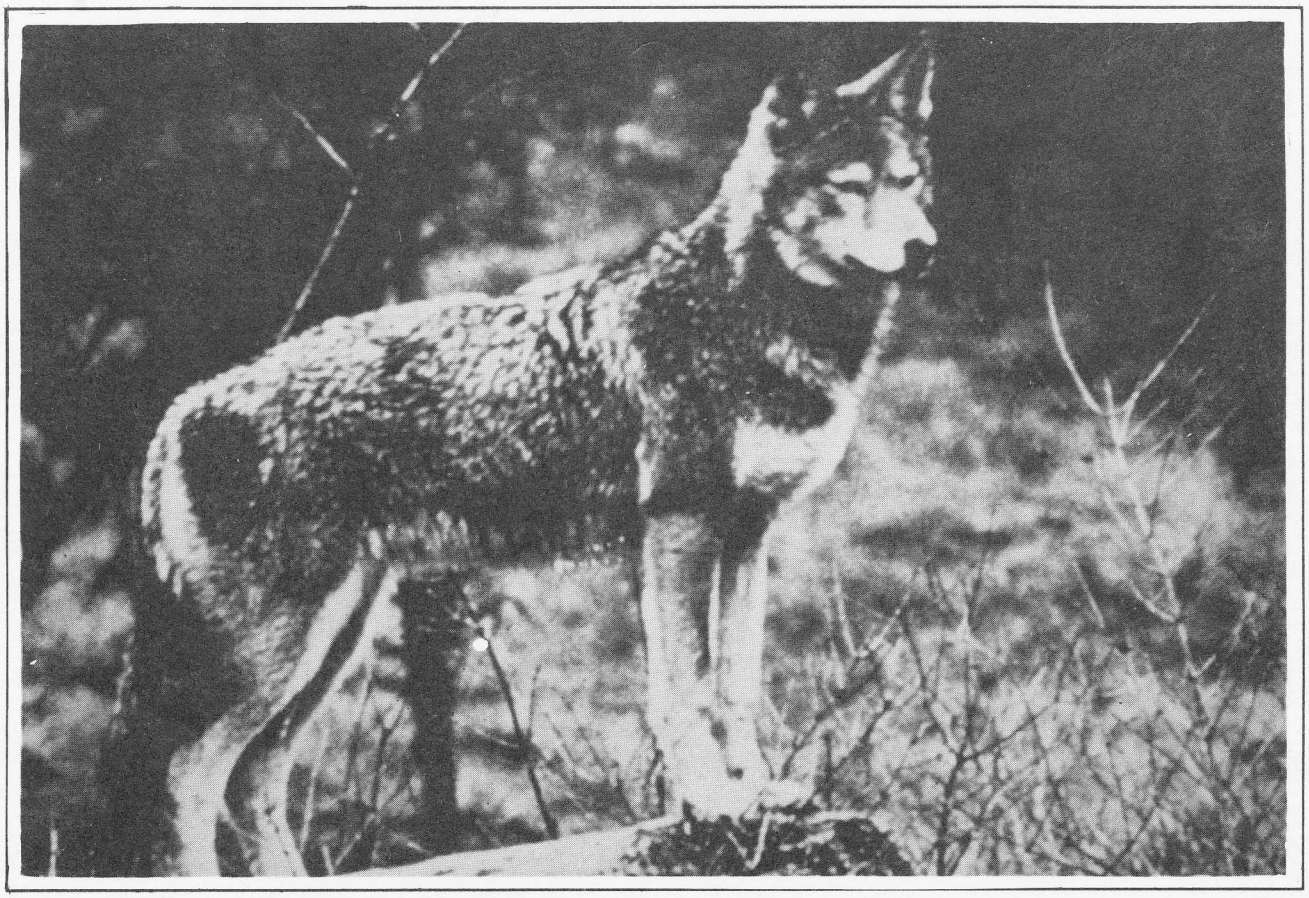

U.S. FISH AND WILDLIFE SERVICE
SOUTHEAST REGION
ATLANTA, GEORGIA

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A PLAN FOR REESTABLISHING THE RED WOLF ON ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE, NORTH CAROLINA

BY

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INTRODUCTION

This technical report has been prepared to serve as a planning guide for the eventual reintroduction of a small number of self-sustaining populations of endangered red wolves (Canis rufus) within the species' historic range. The particular site this proposal is tailored for is the lands that presently comprise the Fish and Wildlife Service's Alligator River National Wildlife Refuge in Dare County, North Carolina. At the present time the species is extirpated from the wild, and 76 animals remain in captive breeding projects and zoos in the United States. Of these 76 wolves, eight are now being held in acclimation pens at the Alligator River Refuge awaiting release in May 1987. In many respects this species can be described as one of the most precarious of all North American mammals on the Federal list of endangered and threatened species.

Efforts to reestablish the red wolf into portions of its historic range are consistent with Congressional intent as clearly evident in the Endangered Species Act. Reestablishment of wild populations is also the cornerstone of the Red Wolf Recovery Plan. Only through the reestablishment of wild, self-sustaining populations can the red wolf be subjected to natural selective factors and establish a social structure characteristic of the species.

Much of the life history data and techniques of reintroduction material presented in this proposal is a condensation of a proposal to introduce the red wolf onto the Land Between the Lakes (Carley and Mechler, 1983).

KNOWLEDGE OF THE SPECIES

History

When settlers first arrived in the southeastern portion of the United States they encountered large wolf-like animals. These animals, first described by Bartram (1791) in the 18th century, ranged from the Atlantic Seaboard west to central Texas and Oklahoma and northward to the Ohio River Valley. Despite man's persecution, these animals were still common in some isolated areas of the Southeast until the early part of the twentieth century. During the first half of this century, however, wolves were extirpated from practically all of their former range. Very few specimens were preserved, and very little was documented about the animal's appearance and life history.

It is believed that this animal, now known as the red wolf, was represented by three subspecies--the eastern (C. r. floridanus), the western (C. r. rufus), and an intermediate form (C. r. gregoryi). The eastern and western subspecies became extinct during the first half of the twentieth century, but C. r. gregoryi persisted in isolated areas from Mississippi to eastern Texas. This last stronghold was slowly compressed over the years until by the early 1970s only a few animals could be found in southwest Louisiana and southeast Texas.

The rapid decline of the red wolf in the 1900s is thought to have been caused by increases in human population, changes in land use, and predator control activities. Of special note is the fact that as the red wolf declined, the coyote (C. latrans) moved rapidly into western portions of the wolves' former range. When forced into their last bit of coastal prairie habitat, thousands of years of reproductive isolation between the red wolf and coyote broke down and hybridization between the two species resulted.

With the passage of the Endangered Species Act of 1973, new emphasis was given the plight of this species. A management program to save the red wolf was initiated by the FWS. Early results of these efforts simply confirmed that the species was faced with loss of habitat, loss of young to parasites, persecution by man, and dilution of its gene pool by invading coyotes (Carley, 1975).

It was determined that the red wolf could only be saved from sure extinction by a two-pronged effort. The first concentrated on establishing a captive breeding program, and the second effort was to locate and rescue as many pure red wolves as possible for the captive breeding project. In November 1973 a Red Wolf Captive Breeding Program was established through the Point Defiance Zoological Garden of the Metropolitan Park Board of Tacoma, at Tacoma, Washington. In concert with this effort, 40 wild-caught adult red wolves were supplied to the breeding program. The first litters of pups were born at the Point Defiance Zoo in May 1977. The demonstrated reproductive vigor of the species in captivity has allowed the loaning of "surplus" animals to five other zoos and holding facilities in the U.S. Reproductive potential has in fact outstripped the capacity of these facilities, so now reproduction is suppressed in some cases. Of the original 40 animals that were captured in Louisiana and Texas in the mid-70's, only five remain alive today. The remaining 58 animals in captivity are offspring born in captivity and the captive population now has a reproductive potential of several dozen offspring per year.

At the present time there are 76 red wolves in captivity. The breakdown on these animals is as follows: Alligator River Refuge, North Carolina, 8; Washington State project (FWS), 44; Wild Canid Survival Research Center, Missouri, 9; Victoria, Texas Zoo, 2; Baton Rouge, Louisiana Zoo, 2; Audubon Park Zoo, Louisiana, 3; Alexandria Zoo Park, Louisiana, 6; Burnet Park Zoo, New York, 2. These widely disjunct captive groups offer significant security for the species. Health checks are made periodically on all animals. Genetic vigor is carefully maintained by yearly interchange of animals from one project to another, through a scientific scheme developed by the American Association of Zoological Parks and Aquaria, documented in its Red Wolf Species Survival Plan and associated stud books.

The uniqueness of this species is that it is extirpated from the wild. Only through the reintroduction of the red wolf into secured areas, such as the Alligator River National Wildlife Refuge, can the species have any hope of

surviving as a truly wild animal. In light of the red wolf's reproductive vigor in captivity, and the number of widely separated and secured captive projects, the survival of the species is biologically assured even if the 10-12 animals selected for reintroduction are all lost.

Once the species' fate was secured via development of captive breeding techniques, the FWS turned its attention to the potential for reintroducing the animal into more favorable habitats within the species' home range. To ascertain the reality of this objective, an experimental release of mated pairs of adult wild-caught red wolves was tested on Bulls Island of the Cape Romain National Wildlife Refuge near Charleston, South Carolina, in 1976 and 1978 (Carley, 1979; Carley, 1981). The experiments were terminated and healthy animals returned to captivity only because Bull's Island was not big enough to support a self-sustaining population. These one-year experiments demonstrated that it is feasible to reestablish adult wild-caught red wolves in selected habitats in the wild. Observations on the species indicate that the establishment of captive-reared specimens in wild situations is also feasible.

Description

In general, red wolves are intermediate in size between the larger gray wolf (*C. lupus*), which existed to the north and west, and the smaller coyote of the Western United States. Typically, an adult female will weigh 40 to 60 pounds, while an adult male will weigh 60 to 80 pounds. The red wolf is generally more lanky than the gray wolf, with long, slender legs that some say are an adaptation to long-distance running and pursuing prey in river bottom swamps and wet coastal prairies.

Coloration is apt to be a misleading characteristic for this species. The reddish color referenced in its common and scientific name actually was only typical in certain populations in Texas. There evidently was considerable color variation across its range that also included black, brown, gray, and yellow. The best taxonomic guidance for live animals is general body size, structure, and weight.

Despite early taxonomic squabbling over the status of this species, it is now considered a true species beyond question. Its place in the evolutionary ladder of the family Canidae will probably always remain uncertain. There is some evidence, however, that supports the thesis that the red wolf actually represents the surviving line of primitive wolves that once ranged over North America a million years ago (Nowak, 1972). Various climatic and competitive changes gradually forced the species southward and eastward into the area where they were first encountered by Bartram (1791).

Life History

In trying to tie together the bits and pieces of factual information regarding the ecology, reproduction, and social structure of this species, it becomes obvious that most information is based on the remnant animals found in Louisiana and Texas, the experimental release onto Bulls Island, South Carolina, and from the captive breeding program. Hardly any reliable information is available on the species when it occurred in significant numbers in the wild.

Unlike the gray wolf, the red wolf is not so much a predator on big game animals. Early accounts generally refer to smaller animals being the mainstay of their diet. The recent (1978) one-year release of a pair of red wolves onto Bulls Island, South Carolina, confirmed this through an analysis of red wolf scats collected during the project. Marsh rabbits, small rodents, squirrels, muskrats and nutria, fish, insects, and plant material apparently are preferred food species, with rabbits and hares leading the list. An occasional deer or domestic animal will be taken if the right opportunity presents itself. Such livestock predation could be expected where chickens, sheep, goats, and unattended calves are permitted to run free.

It is thought that red wolves travel in family groups, but the actual relationship of wild adults to one another is not clear. If they reflect characteristics of the gray wolf, then mated red wolf pairs will stay together as a basic family unit. Translocated wolves, thought to be naturally mated pairs due to the circumstances of their capture, have stayed together. Much of our knowledge concerning the social structure of the red wolf can only be answered through a long-term, well documented reintroduction effort.

Although the last remnant population of this species was situated in coastal prairie marshes of Louisiana and Texas, many agree that this environment probably does not typify preferred red wolf habitat. Some information exists that the species usually was found in highest numbers in the once extensive bottomland river forests and swamps of the Southeast. Heavy vegetative cover does seem to be a needed component of their overall habitat requirements. Radio telemetry studies of red wolves in their final range in Louisiana and Texas indicated that the heavy cover provided along bayous and in fallow fields constituted the primary resting and denning areas for the animals.

Like the coyote and gray wolf, red wolves breed only once a year, either in February or March. The gestation period is 60 to 63 days, and pups are born in April or May. While some females are capable of breeding at nine months of age, it is more common for them to breed in their second season, which occurs when they are about 21 months old. It is generally agreed that male wolves are not sexually mature before at least their third breeding season which occurs when they are about 33 months old. Litter sizes in captivity range from 2 to 8 pups, with an average of 4.6 per litter.

Speculation abounds that wolves breed freely with coyotes and dogs, with resulting offspring that exhibit innate cunning. In reality, such occurrences in the wild are evidently quite rare with resulting offspring that find it difficult to compete with wild wolves or coyotes. These hybrid offspring also exhibit decreased fecundity. Mengel (1971) states that everything points to the decided probability that dog genes do not figure significantly into wild canids in North America. Those red wolves that interbred with coyotes in Louisiana and Texas were individual animals that had lost mates, and with their population at an extreme low, they simply couldn't locate another wolf mate. Such hybrids never apparently figured in the population dynamics of either the red wolf or coyote while the two species' range coexisted for thousands of years along a line through central Texas and Oklahoma. The abundance of farm dogs in wolf range in Minnesota is not known to have resulted in dog/gray wolf hybridization (Mech, personal communication). Indeed, according to Nowak (1972), the wolves of Texas and Louisiana reportedly took a toll of domestic dogs.

The .ome range of a red wolf is undoubtedly dependent upon the quality of the habitat in which it resides. Any discussion of habitat quality is of course based on cover, prey availability, and terrain features. Telemetry studies of red wolves in Louisiana and Texas indicated that animals often traversed areas larger than required for the purposes of securing food. Shaw (1975) reported an average home range of 17 square miles for two female and five male animals involved in a study of red wolf range in 1972. Riley and McBride (1972), by systematic tracking of three adult animals for over a year, estimated the home range of a red wolf to be 25 to 50 square miles. In a telemetry study in 1974, recovery program biologists concluded that male red wolves ranged over an area of about 45 square miles while the range of females was somewhat smaller, averaging 25 to 30 square miles (Carley, 1975).

Under wild conditions, red wolves were found to be predominantly nocturnal, with highest periods of activity being from 8:00 p.m. to midnight (Carley, 1975; Shaw, 1975). Another period of activity appears to be from about 3:00 a.m. until dawn. During winter months, red wolves tend to become more diurnal.

REQUIREMENTS OF THE SPECIES

As is true with any species, the survival requirements of the red wolf are: (1) adequate food, water, and cover; (2) its gene pool must be protected from dilution; and (3) it must be allowed to exist without persecution by man. A discussion of each of these factors follows as they pertain to the red wolf.

Adequate Food, Water, and Cover

In examining sites for a reintroduction attempt, surveys of the primary food base of the red wolf is a critical requisite. Historical large and small mammal surveys, annual commercial trapper catch and interviews, harvest surveys and hunter interviews, on-site inspections that include track and scat counts, call surveys, and actual trapping of small mammals on designated survey routes are all techniques that yield valuable information as to prey composition and abundance. Abundance of game and small mammal trails as observed on foot and from aerial surveys, as well as night lighting, also complement these efforts. Only by expending considerable time on an area can one develop the important "feel" for the actual prey base. Cover requirements can be a more difficult determination. The best available information indicates that heavy vegetation is needed by the red wolf. How much is enough probably will never be answered until an actual long-term release is made. Based on known home range requirements, the establishment of a limited free-roaming red wolf population will require a minimum land area of about 225 square miles (144,000 acres). The configuration of the area, drainage and topography, distribution and abundance of prey species, and likely travel routes that the animals will utilize will determine more precisely the maximum population that any particular area can sustain. The 144,000-acre figure should be viewed as a planning guide only.

Gene Pool Protection

Since coyote-red wolf interbreeding became a factor in the demise of that last remaining population of wild red wolves in Louisiana and Texas, it is of great importance that this factor be carefully weighed. Obviously, a coyote-free environment would be ideal for any reintroduction attempt. Canid experts believe that once a red wolf population is reestablished, other wild canids will honor or respect the home ranges established by respective family groups. When family groups are maintained, there is evidence that gray wolves will kill intruding coyotes (Fuller et al., 1981). The same response mechanism can be expected of the red wolf. Regarding feral and hunting dogs, the problem of potential interbreeding is of a much lower magnitude, and likely is not a factor. Packs of hunting dogs would simply be avoided by resident wolves. Because deer or 'coon hunting is a seasonal activity and dogs are gathered up at the end of the hunt, the interaction of red wolves and hunting dogs would be considered a very minimal possibility.

Coexistence With Man

The degree to which the red wolf can exist in the presence of man is almost entirely dependent on the attitude of the human population within and adjacent to the selected study area. The red wolf is a highly secretive, nocturnal animal and was seldom seen under wild conditions. The species recently occurred in an area of Louisiana and Texas with a relatively high human population and very few conflicts developed. The red wolf presents

little direct threat to man, but will occasionally prey on domestic animals. Most of man's fears about wolves, especially red wolves, are imagined. There are no recorded incidents of red wolves attacking man; indeed, the animals in the captive breeding program are handled when needed for examination or treatment with little if any aggressive behavior exhibited by the wolves. Potential release sites should not be excluded because of the presence of man unless that presence poses a direct threat to the survival of the wolf. Many landowners in the recent range of the red wolf expressed concern over the fact that the animals would soon be gone from their lands.

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

On March 15, 1984, nearly 120,000 acres of land in Dare and Tyrrell Counties, North Carolina, were donated by the Prudential Insurance Company to the Federal government. These lands, now administered by the FWS as the Alligator River National Wildlife Refuge, comprise some of the finest wetland ecosystems found in the Mid-Atlantic Region of the United States. Major natural communities in the new refuge include vast expanses of non-riverine swamp forest, pocosins, and freshwater and salt marshes.

Mainland Dare County is geographically a most unique land form. It is bounded on the east, north, and west by broad, extensive expanses of water made up of Albermarle, Croatan, and Pamlico Sounds, and the Alligator River. The 6.5-mile southern boundary of the county is connected to Hyde County. The refuge is an isolated, sparsely settled area with only two paved highways providing all-weather vehicular access. Situated in the southern third of the refuge is the 46,621-acre Dare County Bomb Range, a major training facility of the U.S. Navy and the U.S. Air Force. The U.S. Air Force administers the range. Recent agreements signed between the U.S. Air Force and the North Carolina Department of Natural Resources and Community Development have designated a substantial acreage of range buffer lands as registered and protected Natural Heritage Areas. About 23,000 acres of the original Prudential Insurance Company lands were retained by the company in mainland Dare County. About 5,000 acres of these lands have been cleared and are now in row crop production (soybeans and corn), just south of U.S. Highway 64. There are three small communities on the mainland of Dare County. These are Manns Harbor, Stumpy Point, and East Lake. The total human population of mainland Dare County is slightly more than 1,000 people, most of whom live in Manns Harbor. The majority of the populace is rooted in the ways of the traditional waterman, with considerable commercial fishing and oystering originating in these local communities. Hunting and trapping are also traditional ways of life and both are actively pursued. Elevations on the mainland do not exceed 12 feet. Soils are generally organic with only scattered pockets that are of mineral origin. The vegetation of the refuge is typical of the remainder of the county and can be generalized as a vast, diverse wetland type. Much of the forests of the refuge has been exploited in the past. Today, expanses of bald cypress (Taxodium distichum), swamp

black gum (Nyssa aquatica), blackgum (Nyssa sylvatica), Atlantic white cedar (Champaecyparis thyoides), and loblolly pine (Pinus taeda) typify the western portions of the refuge along the Alligator River. These swamp forests grade gradually eastward into extensive areas of pocosins that are best characterized by scattered pond pine (P. serotina) and low evergreen shrubs over wet peatlands. Some commercial logging continues, especially for the Atlantic white cedar.

Within this complex wetland system is found a diverse and unique fauna. Black bear (Ursus americanus) are common throughout the refuge. White-tailed deer (Odocoileus virginianus) are present in moderate numbers, and evidently the northernmost population of endangered American alligators (Alligator mississippiensis) are also present on the refuge in low numbers. The endangered red-cockaded woodpecker (Picoides borealis) occurs in remnant numbers in the southern portion of the refuge. Bobcats (Lynx rufus floridanus) appear to be relatively common throughout the refuge, as are raccoons (Procyon lotor), mink (Mustela vison), gray foxes (Urocyon cinereoargenteus), and river otter (Lutra canadensis lataxina). A small population of free-roaming domestic goats (Capra hircus) is found in the low shrub pocosins in the southern portions of the refuge and on the bombing range.

The marsh rabbit (Sylvilagus palustris) is common on all refuge lands but is most abundant in areas adjacent to clearings, roads, and other open sites. Gray squirrels (Sciurus carolinensis) were found to be surprisingly abundant, especially in those areas of the refuge dominated by mature pond pine, where it obviously forages extensively on pine cones. Muskrat (Ondatra zibethica) are abundant in ditches and canals and in the Roanoke marshes, while beaver (Castor canadensis) are evidently present in low numbers in the southern portion of the refuge. The nutria (Myocastor coypus) occurs in small numbers along the most northern reaches of the refuge.

Extensive small mammal surveys on mainland Dare County were conducted on contract to the FWS by the North Carolina Biological Survey (Potter, 1982). This information was augmented by approximately 1,500 trap nights run by FWS and Biological Survey personnel in the nearly impenetrable Mashoes Pocosin north of U.S. Highway 64 during the January to March period of 1985. The results of these surveys indicate at least a moderate to high population of small rodents represented by such species as the white-footed mouse (Peromyscus leucopus), golden mouse (P. nuttalli), and the southeastern shrew (Sorex longirostris). Approximately 100 miles of canid surveys were undertaken in an effort to determine the feral dog and existing wild canid population on the refuge. This particular census, run during the January to February period of 1985, involved the solicitation of vocalizations by the use of an electronic police siren (McCarley, 1978; McCarley and Carley, 1979). This technique has been proven successful in determining whether wild canid offspring are traveling with their parents,

and, if so, providing an indication as to how many animals are present (Carley, 1973; Wengar and Cringen, 1978). Results of these surveys indicate the absence of coyotes, feral dogs, and other wild canids.

Master planning for future refuge operations is completed. A list of refuge objectives has been developed as follows: (1) protection of the refuge's unique wetland habitats, (2) protection and management of endangered species, (3) management and protection of the refuge's black bear population, (4) waterfowl conservation, (5) protection and management of all other wildlife categories, including game and non-game species on the refuge, (6) consumptive use of the natural resources of the refuge (hunting, fishing, trapping, firewood cutting, etc.), and (7) non-consumptive use of the refuge (camping, hiking, etc.). A series of four public meetings was held in the area and input solicited on how the local populace views the new refuge, its proposed objectives, and future management. Several salient points surfaced during these meetings. One is that the local people are very much interested in this refuge and how it is to be operated. This was evidenced by the size of turnouts and the input received at each of the four meetings. Secondly, the consensus seems obvious that the people of Dare County want to continue traditional usages of the property as much as possible. On the other side of the issue, the frank expressions on the part of the public to abide with eventual refuge management decisions were most refreshing.

One of the uses presently being made of the refuge is the traditional method of hunting deer by running packs of dogs into inaccessible habitat and flushing deer from this thick cover. Refuge master planning has incorporated into the preferred management alternative specific areas of the refuge for dog-deer hunting as well as areas reserved for still hunting. It is thought that dog-deer hunting would not be detrimental to the establishment of a red wolf population on the refuge.

REINTRODUCTION PHILOSOPHY AND STRATEGY

It is generally assumed that reintroduction of a species simply requires the release of animals into a suitable new environment. However, reintroductions are more complicated than assumed in that there are numerous considerations that must be addressed prior to release. These concerns include subtle balances within the ecosystem, the nature and abilities of the animals, a means of determining the impacts that the reintroduced species may have on the environment, public understanding and acceptance of the objectives of the program, and legal and administrative responsibilities.

It has been determined that reestablishment in the wild is the only means by which the red wolf can be preserved as a naturally occurring element of our national heritage. The red wolf, which is biologically extirpated from the wild, is worthy of reintroduction, and the knowledge and techniques required to accomplish such a task are now available.

Several strategies have been advanced regarding the reintroduction of the red wolf. One calls for the use of islands along the Southeastern Coast of the United States. Many of these islands, with their typically small size, could probably accommodate several pairs of wolves. Such an introduction was proven feasible with the release of four timber wolves on Coronation Island in southeastern Alaska in 1960 (Merriam, 1964). When striving for the recovery of an endangered species, however, island populations fail to meet several stringent needs. The most important is that the small size of these islands fails to allow for the genetic heterozygosity that the red wolf desperately needs. To overcome this problem, offspring of animals would have to be captured from one island population and introduced into another to reduce as much as possible the problems with inbreeding. The use of islands for introductions is therefore considered feasible only for short periods of time to "acclimate" animals to the wild or to conduct special experiments or studies.

The other strategy, and the one considered most desirable, is to introduce mated pairs into large, unconfined mainland sites that will allow the natural laws of the ecosystem to control the wolf population. Such controls permit the establishment of a social structure through natural selection. Only through this selection process can a population truly become wild and self-sustaining and thus satisfy the objectives of the recovery plan. Scientifically, the established population would also provide the opportunity to study a naturally occurring population of red wolves, thus affording an opportunity to record much of the information about this species that was not recorded in the past. Such information would be essential in attempting other reintroduction efforts elsewhere. A population would be considered established when offspring born in the wild on the site are themselves determined to be producing offspring.

The Alligator River National Wildlife Refuge possesses many unique characteristics that make it a primary candidate for a red wolf reintroduction attempt. Indeed, there may not be another area within the historic range of the species that has the attributes of the Alligator River Refuge. It and adjacent Department of Defense lands essentially comprise a large peninsula and as such provides reduced access and would restrict the movement of introduced red wolves. It is large enough for establishment of a number of family groups which would aid in avoiding further inbreeding. It has a substantial prey base that apparently sustains only limited predation by black bears, bobcats, gray foxes, and great horned owls.

The reintroduced red wolves would have to become a part of their new environment and be acceptable to the ongoing and long-term management programs of the refuge. It is essential that this condition be clearly understood, for the ultimate recovery of the species depends on the reestablishment of at least three self-sustaining populations within its historic range. If an initial reintroduction is tempered by significant

changes in other management objectives to accommodate the red wolf, then little hope can be extended to other Federal land managing agencies that an introduction onto their lands would not also disrupt their programs. It is the sincere belief of all the biologists who have worked with this species that the red wolf will make it on its own, if only provided the chance to do so.

Because of the uncertainties involved with the release of a predatory animal into a wild environment, it must be understood that the first five years of an introduction effort will be considered experimental. During this period, key elements of the refuge ecosystem will be monitored as well as the wolves themselves. If serious conflicts arise, the project must be subject to cessation and the animals removed.

In the 1978 one-year experimental release of red wolves onto Bulls Island of the Cape Romain National Wildlife Refuge, it was clearly demonstrated that biologists were able to monitor the activities of the animals and recapture the wolves under varying circumstances (Carley, 1981). It was also demonstrated that public support for that project was obtained by full divulgence of the purpose, procedures, strengths, weaknesses, and progress of the project. Public support for the experiment was paramount to its success.

In an effort to permit reintroductions of this type, Congress amended the Endangered Species Act in 1982. This amendment now allows the release of endangered and threatened animals under the special designation of "experimental," if such releases are deemed necessary for the continued well being of the species. The "experimental" designation must further be defined as either "essential" or "non-essential," with a special clause that allows the individual animals to be treated as a threatened species. Furthermore, red wolves released onto the Alligator River National Wildlife Refuge would have to be treated as "experimental" but with the full protection of Section 7 provided so long as the animals or their offspring remain on the refuge. Any of the original animals or their offspring that leave the refuge and enter private lands during the initial five-year phase of the project would be captured by the FWS and probably returned to the captive breeding program. Animals that leave the refuge to other lands, such as Department of Defense lands, would be considered as a species proposed to be listed for purposes of Section 7 of the Act. This means that other Federal land management agencies would have to confer with the FWS on their activities that might jeopardize the wolves, but the results of such conferences would be strictly advisory to the other agency.

It is proposed that, during the five-year experimental phase of this project, the sponsors of the reintroduction will exert every effort to recapture any red wolves that leave the confines of the Alligator River National Wildlife Refuge. If, after the five-year phase, the reintroduction effort has proven successful, the animals will remain as a threatened species and will be considered to be an integral component of the refuge ecosystem. The special

rulemaking concerning designation of animals on other lands will continue in effect on an indefinite basis.

PROJECT OPERATIONAL GUIDELINES AND PROCEDURES

In view of the complicated and controversial nature of this proposal, it is essential that clearly understood and mutually agreed upon operational guidelines and procedures be established. These are as follows:

1. The FWS sponsored four public meetings in the Dare County project area to solicit public input on the refuge master plan and the red wolf proposal and consulted in detail with the North Carolina Wildlife Resources Commission (NCWRC). The red wolf reintroduction proposal received overwhelming public support.

2. Individual wolves selected for experimental reestablishment on the Alligator River National Wildlife Refuge, as well as all subsequent offspring, will collectively be classified as an "experimental population" under the Endangered Species Act. Special regulations which permit their management and integration with other State and Federal programs were developed by the FWS in cooperation with all involved agencies before being published in the Federal Register. (A Federal Register notice on the experimental, nonessential designation of red wolves selected for reintroduction was published as a final rule on November 19, 1986 (Vol. 51, No. 223, 41790-41796).

3. On November 12, 1986, four pairs of wolves were transported to the refuge, and are being acclimated in holding pens for 6 months, and in May 1987, these animals will be released. If the releases are successful, 2 more pairs will be brought to the refuge in November 1987, acclimated for 6 months, and released the following spring.

4. The red wolf will be considered as being established on the refuge when offspring born in the wild to the originally reintroduced wolves are themselves determined to be reproducing.

5. Should the original wolves or their offspring leave the refuge during the five-year experimental phase, project personnel will be permitted by the NCWRC to attempt to capture the animals.

6. The project will be considered as an "experimental" project for a five-year period, during which time the wolves will be closely monitored and studied and their status evaluated. At the end of the five-year experimental phase of the project, the entire Alligator River National Wildlife Refuge reintroduction effort will be reviewed by the FWS and the NCWRC and a decision made concerning the success of the project and the desirability of continuing the program determined.

Public opinion will be solicited through a series of public meetings sponsored by the FWS.

INITIAL PREPARATIONS

Public Information

Because the word "wolf" attracts considerable public interest and typically surfaces childhood impressions of these animals, it is absolutely imperative that factual information be distributed. A previous attempt to reintroduce the red wolf in Kentucky and Tennessee failed in part because public awareness of the project was very sketchy. Informing the public in the Dare County area of the true nature of the red wolf and the need for the reestablishment project was considered to be paramount to the success of the effort. This must be done objectively and honestly and supported strictly by experience and fact.

A FWS information specialist is responsible for coordinating public information activities of the project. A methodology will be developed that will optimize dissemination of information to the public throughout the initial phases of the project, assist in actual dissemination, and direct inquiries from the public to the proper authorities. The news media and local outdoor writers will be encouraged to write articles about the project, and local newscasters will be given advance notice of project activities.

Public Meetings

Once the public information program had been active for several months, the FWS sponsored a series of four public meetings. One meeting was held in adjacent Tyrrell County and three were held in Dare County.

The purpose of the meetings was to inform those attending of the nature of the proposed project and record comments expressed by the public. It is at these meetings that every effort was expended to engender the support of the interested populace. It is considered imperative that the public support the reintroduction attempt.

A most crucial stage was the final review of the proposal by the FWS in concert with the NCWRC. Since public support was obvious, the chances for the ultimate success of the proposal was greatly enhanced. Project coordinators reviewed public meeting results to determine if any suggested changes in the proposal could have been made. The final decision to either proceed with the proposal or abandon the effort was made by the Regional Director of the FWS in consultation with the Director of the NCWRC.

REESTABLISHMENT PLAN

Once approval of the project was received, several strategies were initiated simultaneously. These included (1) administrative efforts to fulfill the conditions of the proposal itself, (2) acceleration of the public information program, and (3) preparation of the reintroduction site.

Administrative Efforts

The FWS developed an environmental assessment and a special rulemaking package for the relisting of those experimentally reintroduced animals and the resulting population which included specific regulations permitting management of the wolves. An intra-Service Section 7 consultation under Section 7 of the Act was conducted to ensure that the activity was not likely to jeopardize the continued existence of the species. Endangered species and necessary State permits were obtained. Funding needs for a project of this size were forthcoming through a Congressional add-on of endangered species monies.

Public Information Program

The period of time from project approval to actually bringing mated pairs of wolves to the refuge for acclimation and eventual release attracted a great deal of interest by the news media, much of which was national and international in scope. Similar interest can be expected after releases are made, with a gradual tapering off after the initial three to five months.

Preparation of Reintroduction Site

Acclimation pens were constructed on the Alligator River National Wildlife Refuge prior to the receipt of the first mated pairs of wolves, and project personnel were trained in the care and handling of the animals during the six-month acclimation period. In addition, a radio telemetry tracking system was developed and personnel trained in its utilization from mobile and fixed ground stations, as well as its use when tracking from boats or aircraft.

Specific activities to be followed in a red wolf reintroduction at Alligator River National Wildlife Refuge are now presented in detail.

Prey and Predator Surveys

After approval of the project, surveys were initiated to determine the status of selected key prey species and resident predator species on the refuge. These pre-project surveys not only served to assist the refuge manager in better determining "what's on this new refuge," but will serve in any post-project analysis of impacts the red wolves are having on such species as deer, marsh rabbits, bobcats, and foxes. Monitoring of selected prey and

predator species will continue, probably through the five-year experimental phase of the project.

Personnel needed to carry out the various project field activities on the Alligator River Refuge project were effected via transfer of one FWS employee and the hiring of one new employee. Four animal caretakers were hired as temporary employees for the six-month period needed for acclimation. These particular workers feed and water the animals and provide around-the-clock security "on site" with the paired wolves. A daily log is also kept for each pen site and its pair of wolves. The red wolf project coordinator, located at the Asheville, North Carolina, FWS field office, is responsible for overall project direction and coordination. The refuge manager at Alligator River National Wildlife Refuge provides daily direction to the two field biologists in charge of routine red wolf activities.

It will be the FWS Endangered Species Field Office project coordinator's responsibility to see that all necessary equipment and supplies are available, that the wolves are properly maintained during the acclimation period, that required monitoring of the released wolves and the ecosystem are carried out, and that all involved parties are kept informed. In addition, the project coordinator will control the access and involvement of any parties desiring to participate in the program. A local veterinarian has been contracted for services on an "as needed" basis. He is responsible for providing general health care of the animals throughout the acclimation period and for the potential care of injured animals retrieved after releases are made.

Selection of Wolves and Acclimation

Wolves used for experimental reestablishment were selected from the certified breeding stock of the FWS Red Wolf Recovery Program. Factors that were considered in the selection of animals included age, health, genetics, breeding history, behavior, and physical traits representative of the species.

On November 12, 1986, four pairs of wolves were commercially air-freighted to Raleigh, North Carolina, using shipping procedures established by the Red Wolf Captive Breeding Program. These animals were transferred by U.S. Coast Guard helicopter to the Alligator River National Wildlife Refuge. Each pair of wolves was released that afternoon into its 50- by 50-foot acclimation pen where the animals will remain until release in May 1987. Security of the acclimation sites will be a FWS responsibility, and sites will be manned around the clock by paid workers with two-way radio capability. Refuge personnel have been given emergency procedures to follow in contacting the project coordinator, contract veterinarian, and designated NCWRC and other FWS personnel.

The four acclimation pens are located in isolated wooded areas. Each 50- x 50-foot pen will provide adequate space for one pair of animals. The pens are 8.5 feet high and have a 3-foot wide "ground wire" buried 6 inches

below the soil surface around the inside perimeter of the pen. The wolves were fitted with temporary radio collars upon arrival at the refuge and prior to their release into the acclimation pens. This procedure will permit the animals to get used to wearing the collars, will provide experience for workers in the utilization of radio telemetry equipment, and will make recovery of escaped animals much simpler.

Once in their pens, access to the sites was restricted and human activity kept to an absolute minimum. The wolves will be maintained according to guidelines provided by the Red Wolf Captive Breeding Program. Initially they were fed and watered each day, at which time their transmitter signal was checked to make sure it was working, their pens were examined for signs of possible "digging out," and the animals were checked to make sure they were active and healthy. Fecal samples are collected at intervals to check for evidence of internal parasites. The animals were fed for the first several months as they had been in the captive breeding program. In January, they were initiated to the meat of prey species and eventually to unskinned but eviscerated carcasses of primary prey species found on the refuge. This procedure will be increased monthly until the animals are subsisting wholly on live and dead prey species.

Release

Spring is selected as the best time for a release. It will have given the wolves six months to adjust to their new environment. This was found to be a critical element in the Bulls Island experiment in 1978. It also is the period of the year when more young and less wary prey specimens are available. This in turn will provide the wolves greater opportunity to gain experience in the capture of prey and improve hunting techniques as prey become less available and more wary.

Release Locations

It is felt that the release areas for individual pairs should be widely separated so as to avoid potential territorial conflicts during the early part of the project. In addition, areas selected for release should be accessible to radio tracking vehicles and yet not have excessive public vehicular traffic. Release sites include the dense pocosins north of U.S. Highway 64, the general area between Manns Harbor and Stumpy Point known as the Roanoke Marshes, and the area west of Milltail Creek. Animals will be released as pairs over a staggered period of five to six weeks. Specific release points for the additional two pairs a year later (spring of 1988) will be selected on the basis of territorial information and other data gathered from the first three pairs.

About a month prior to release, each animal will be fitted with a new 3-M Corporation "capture" and transmitter collar. Activating the transmitters a

month prior to release will allow personnel sufficient time to monitor the units to ensure their reliability.

At the present time it is anticipated that much of the early tracking of released animals will be done from a fixed-winged FWS or rental aircraft. The density of the vegetation throughout much of mainland Dare County will handicap signals generated from the collars worn by released wolves. After release, it is anticipated that animals will be tracked continually for the first several weeks, or until the wolves have established predictable movement patterns.

After the mated pairs have established definite home ranges, radio monitoring will be reduced to three times a week. To better understand the behavior of these animals, and their possible impact on the area, it will be necessary to monitor them intensely from time to time. Additional monitoring techniques will be employed, such as the collection and examination of wolf scats. Initially, in the interest of not disturbing scent markings that may delineate the boundaries of the wolves' new territories, most of the scats will be left in place and only grossly examined for prey content (Peters and Mech, 1975; Rothman and Mech, 1979). Later, scats will be collected for laboratory examination of prey content and evidence of internal parasites. By systematically collecting scats throughout the year, personnel should be able to determine primary prey species that the wolves are utilizing on a seasonal basis. Another type of observation on the animals will involve solicitation and recording of their vocalizations (McCarley, 1978; McCarley and Carley, 1979). Details of this procedure have been noted earlier in this proposal during systematic wild canid and feral dog surveys of the refuge. Because many wolves have distinct voices and voice patterns, it is often possible to identify individual animals in the wild utilizing this technique.

Recapture Techniques and Procedures

Equipment and procedures for recapturing released red wolves will be available throughout the project. Recapture techniques will include radio-activated capture collars, tranquilizing darts, modified leg-hold traps, and tranquilizer baits.

Whenever recapture of an animal appears warranted, to expedite the effort, a helicopter will most likely be brought in and the animal tranquilized. However, all available capture techniques will be considered in the light of circumstances and the objectives of the specific recapture effort. Capture techniques utilizing a helicopter were applied in the 1976 and 1978 Bulls Island red wolf projects and were proven to be highly reliable and feasible. The dense vegetation of much of mainland Dare County would prove difficult for this technique, but the capability of the capture collar would eliminate these problems. It appears that in most instances, a helicopter would still be employed in the retrieval of tranquilized red wolves.

Subsequent Years' Activities

The results of first releases will be continuously evaluated and changes made to the methodology as necessary. If the first year's releases are successful, two more pairs will be transported to the refuge in the fall, acclimated, and then released the next spring.

EFFECTS OF WOLF REESTABLISHMENT

The reestablishment of a population of an extinct-in-the-wild species such as the red wolf would attract significant national attention to Dare County, the State of North Carolina, and the Fish and Wildlife Service. This attention would likely draw some members of the public to the area for vacations and a variety of outdoor recreational pursuits. It would also attract some who simply want to be in an area with wild wolves as "neighbors." This nonconsumptive use of a resource could become a major use of the refuge through camping, hiking, and canoeing. These thoughts are based on reports from Algonquin Provincial Park, Ontario, Canada, where the park's gray wolf population attracts thousands of people each year who come expressly to hear wolves howling (Kolenosky et al., 1978). A successful reestablishment, however, would have greater merit than just public appeal. Such a success would be a major move in recovering a species that for all practical purposes is nearly extinct. It would underscore the capability of Federal and State agencies to work cooperatively under very difficult circumstances for the common good of a unique critter that has been absent from eastern North Carolina for over a century.

On the negative side there will always exist the possibility that an animal may get off the refuge and raid a chicken coop or kill a goat on private lands. If this should occur, special provisions in the "experimental" regulation will allow for the removal of offending red wolves. Realistically, this is not expected to be a problem.

Based on experiences with the Land Between the Lakes proposal in Kentucky and Tennessee (Carley, et al., 1983), environmental groups may challenge the issue of public hunting on a refuge that is being used for an experimental red wolf project. If successful, an injunction could close deer hunting for a year. It is believed, however, that by enlisting the help of these various groups early on after project approval, such potential conflicts can be avoided. The experimental designation, as clearly stated by Congress in the 1982 Amendment to the Endangered Species Act, was designed to expressly avoid such Section 7 conflicts.

BUDGET

Due to the many variables that might be encountered, definitive budget estimates have not been fully developed. Actions that would increase estimated costs of the project are: (1) the recapture of animals for transmitter replacement, (2) the return of animals to the captive breeding program, (3) the replacement of animals, and/or (4) temporary suspension of the project. Based on preliminary data, it is thought that the five-year project could be accomplished with a budget of $135,000 per year. This will cover all project costs, including equipment, travel, veterinary expenses, aircraft, staff salaries, and other associated costs.

It should be stressed that the success of the project would lead to a reduction in funding presently required for maintenance of the red wolves in captivity.

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